

In the Claims

1. (Currently Amended) A welding-type wire feeder comprising:
at least one electronically commutated motor (ECM) configured to deliver a consumable for a welding-type process; and
a controller configured to control the at least one ECM, wherein the controller is programmed to switch control of the at least one ECM between any one of torque control, voltage control, current control, constant velocity control, and position control.
2. (Original) The welding-type wire feeder of claim 1 further comprising a commutation feedback loop configured to deliver commutation feedback from the at least one ECM to the controller.
3. (Cancelled).
4. (Original) The welding-type wire feeder of claim 1 wherein the controller is configured to control the at least one ECM to coordinate operation with a motor disposed within a welding-type torch to perform a push-pull consumable delivery process.
5. (Original) The welding-type wire feeder of claim 4 wherein the at least one ECM is controlled by the controller to push the consumable and the ECM disposed within the welding-type torch is controlled to pull the consumable.
6. (Original) The welding-type wire feeder of claim 4 wherein the motor disposed within the welding-type torch includes an ECM.
7. (Original) The welding-type wire feeder of claim 1 wherein the controller is configured to regulate torque of the at least one ECM to perform torque control to deliver the consumable for the welding-type process.
8. (Currently Amended) The welding-type wire feeder of claim 1 wherein the controller is configured to perform angular displacement control to regulate the at ~~least~~ least one ECM to perform the welding-type process.

9. (Original) The welding-type wire feeder of claim 1 further comprising a sensor configured to determine a rotational direction of the at least one ECM.

10. (Original) The welding-type wire feeder of claim 9 wherein the controller is configured to receive feedback from the sensor to control the at least one ECM to change operation from forward operation to reverse operation for a given period upon receiving a command to end delivery of the consumable for the welding-type process.

11. (Original) The welding-type wire feeder of claim 10 wherein reverse operation is performed for given period to remove the consumable a predetermined distance away from a workpiece.

12. (Original) The welding-type wire feeder of claim 1 wherein the welding-type process is a pulsed welding-type process.

13. (Original) The welding-type wire feeder of claim 12 wherein the sensor is a Hall effect sensor configured to detect electrical pulses generated by the at least one ECM to control the delivery of the consumable to control the pulsed welding-type process.

14. (Original) The welding-type wire feeder of claim 1 wherein the controller is further configured to control the at least one ECM according to at least one of a plurality of states.

15. (Original) The welding-type wire feeder of claim 14 wherein the states include a speed control state, a torque control state, a pulsed control state, a constant velocity state, and a position control state.

16. (Original) The welding-type wire feeder of claim 14 further comprising a state controller configured to generate operating parameters corresponding to a current state and communicate the operating parameters to the controller to control the at least one ECM according to the operating parameters.

17. (Original) The welding-type wire feeder of claim 1 wherein the at least one ECM includes at least one of a brushless DC motor, a stepping motor, a switched reluctance motor, and a variable reluctance motor.

18. (Currently Amended) A method of delivering a consumable for a welding-type process comprising:

electronically commutating an ECM to deliver a consumable for a welding-type process;

monitoring feedback from at least a select one of a number of feedback sensors arranged about a consumable delivery mechanism; and

automatically adjusting the electronic commutation of the ECM in response to the selected sensor and resulting consumable delivery feedback to perform the welding-type process.

19. (Original) The method of claim 18 wherein delivery of a consumable includes at least one of a push operation and a pull operation.

20. (Original) The method of claim 18 further comprising receiving commutation feedback from the ECM to automatically adjust the electric commutation.

21. (Original) The method of claim 18 further comprising controlling a delivery speed of the consumable to control a pulsed welding-type process.

22. (Original) The method of claim 18 further comprising reversing the delivery of the consumable upon at least one of a break in the welding-type process and a completion of the welding-type process.

23. (Original) The method of claim 18 further comprising monitoring an angular displacement of a shaft of the ECM and regulating the electronic commutating to control the delivery of the consumable based on the angular displacement of the ECM shaft.

24. (Original) The method of claim 18 further comprising automatically detecting another ECM and controlling operation of the ECMs to perform a push-pull delivery of the consumable.

25. (Original) The method of claim 24 further comprising coordinating operation of the ECMs to perform at least one of a user-prompted acceleration, deceleration, and braking.

26. (Original) The method of claim 24 further comprising monitoring user input and coordinating operation of the ECMs to perform a braking operation including reversing delivery of the consumable away from a workpiece.

27. (Currently Amended) A welding-type apparatus comprising:
a wire feeder configured to deliver a welding-type consumable to perform a welding-type process;
a wire feeder ECM configured to drive the wire feeder according to at least one of a push configuration and a pull configuration; and
a motor control configured to ~~control~~ control the wire feeder ECM
a controller configured to detect the welding-type torch ECM and automatically switch a control state from one of a voltage regulation state and a current regulation state to a torque regulation state.

28. (Original) The apparatus of claim 27 further comprising:
a welding-type torch configured to perform the welding-type process; and
a welding-type torch ECM configured to receive the consumable from the wire feeder ECM and deliver the consumable to a workpiece.

29. (Cancelled).

30. (Currently Amended) The apparatus of ~~claim 29~~ claim 27 wherein the controller is further configured to coordinate control of the wire feeder ECM and welding-type torch ECM to perform a push-pull consumable delivery process.

31. (Currently Amended) The apparatus of ~~claim 29~~claim 27 wherein the controller is configured to receive commutation feedback from the ECM.

32. (Currently Amended) The apparatus of ~~claim 29~~claim 27 wherein the controller is configured to torque control the wire feeder ECM and welding-type torch ECM.

33. (Original) The apparatus of claim 28 wherein the welding-type process includes at least one of a metal inert gas (MIG) welding-type process, tungsten inert gas (TIG) welding-type process, a shielded metal arc welding (SMAW) welding-type process, an induction heating process, and a plasma-cutting process.

34. (New) A method of delivering a consumable for a welding-type process comprising:

electronically commutating an ECM to deliver a consumable for a welding-type process;

selecting at least one of a number of feedback sensors based on a current control state of the ECM;

monitoring feedback from the selected at least one feedback sensors arranged about a consumable delivery mechanism; and

automatically adjusting the electronic commutation of the ECM in response to the selected sensor and resulting consumable delivery feedback to perform the welding-type process.

35. (New) The method of delivering a consumable for a welding-type process of claim 34 further comprising:

changing an ECM operation from forward operation to reverse operation for a given period in response to receiving a command to end delivery of the consumable for the welding-type process.

36. (New) The method of delivering a consumable for a welding-type process of claim 34 further comprising:

changing the current control state of the ECM to a subsequent control state, wherein the current control state and the subsequent control state are one of:

a speed control state, a torque control state, a pulsed control state, a constant velocity state, and a position control state.

37. (New) The method of delivering a consumable for a welding-type process of claim 36 further comprising:

generating operating parameters corresponding to the current control state;

communicating the operating parameters to control the at least one ECM according to the operating parameters;

generating subsequent operating parameters corresponding to the subsequent control state; and

communicating the subsequent operating parameters to control the at least one ECM according to the subsequent operating parameters.